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THE NEW ENGLAND BOTANICAL CLUB

Vol. 23. September, 1921. No. 273.

CIMICIFUGA RACEMOSA IN MASSACHUSETTS.

J. R. Churchill.

(Plate 132)

In October, 1919, I found in Sheffield, Berkshire County, Massachusetts, the withered stalk of a plant which I identified as *Cimicifuga racemosa* (L.) Nutt. It was in wild, steep rocky woods, across the river, and about two miles from the village. In the following year, on July 19, I came upon the plant about a mile from the first station growing scattered in beautiful open woods which sloped steeply down to a brook. It was then in full bloom, and the tall slender plants with the long spikes of white flowers lit up the sombre landscape and were very attractive. Ten days later I visited the first station, where I found the plants now growing vigorously and in great profusion. A photograph here reproduced illustrates the extent of the colony, the height of the plants and their environment. Both localities are quite remote from habitations and the plants appear to be indigenous.

Cimicifuga racemosa has rarely, if ever, been found in New England north of Connecticut, except in cultivation or as a garden escape. It is not in the Flora of Vermont (1915). In the Catalogue of Plants of Connecticut (1910) its occurrence is mentioned at "Norfolk, plentiful at one locality but probably introduced; at Oxford common; and frequent throughout the southwestern part of the state." The Sheffield stations are about five miles north of the Connecticut state line.

In the Gray Manual (1908) the range given is "s. N.E. to Wisc. and s.w., cultivated and escaped eastw." In his Report on the Herbaceous Plants of Massachusetts (1840) the Rev. Chester Dewey describes and mentions *Cimicifuga racemosa*, but only as "cultivated in the gardens of the Shakers."

It is natural that a plant so conspicuous and ornamental should be transplanted into gardens and thence in time again have run wild beyond its normal range. Two extralimital collections in the herbarium of the New England Botanical Club are probably of this class, viz: one by Parlin, Sept. 6, 1899, from "N. Berwick, Me.; growing in an orchard spreading from planted roots;" the other by John Murdoch, Jr., July 22, 1913, from "Bernardston, Mass., woods in E. part of town." A collection by R. Hoffmann from New Marlboro, Mass., a town adjoining Sheffield, and also on the Connecticut state line, may be indigenous, though found "persisting for years under a hedge-row." Bernardston, on the other hand, is in Franklin County, sixty miles northeast of Sheffield, on the Vermont line. Mr. Murdoch died in 1915, and his herbarium, with a duplicate plant and label, is now in the Field Museum of Natural History at Chicago.

In the catalogue of plants growing without cultivation in the vicinity of Amherst College, published by Prof. Edward Hitchcock in 1829, our plant is recorded, on his authority, from Goshen, Mass.; and this record is repeated as late as 1913 by Prof. George E. Stone of the Massachusetts Agricultural College at Amherst in his "List of Plants growing without cultivation in Franklin, Hampshire and Hampden Counties." Goshen is a small town in Hampshire County, southwest of Bernardston. Seeking to confirm so definite, though ancient a record as this I wrote to Prof. Alfred S. Goodale, who kindly reported to me that "a careful inspection of our plant collection at Amherst College fails to show a specimen from our vicinity. I have also examined what is left of Hitchcock's own collection and if it was originally there, it has disappeared from it." He adds, "I have not collected it myself in this region."

In the brief search which I have made, with results stated above, there is little to show the presence of the "Bugbane" or "Black Snakeroot" as a native of Massachusetts, except the stations at Sheffield. Possibly however, this note may be productive of infor-

mation of other collections, either in the field or from herbaria, with data which may verify not only its occurrence here but may determine its status as indigenous or as "cultivated and escaped eastward."

Dorchester, Massachusetts.

A CRITICAL REVISION OF HYDRANGEA ARBORESCENS.

Harold St. John.

Through the discriminating field observations of Mr. Charles C. Deam, the writer has had his attention directed to the conspicuously different plants that are now treated as *Hydrangea arborescens* L. The tendency of the present day authors is to withhold any recognition of these various forms. On the other hand, the writers of the early floras of eastern North America were familiar with some of them and gave them names. Rafinesque, for instance, made eight species out of the plant now considered to be *H. arborescens*. The others were more conservative. As was the case in a previous study of the variations of a polymorphic species,[1] a treatment very similar to that here presented is found in Torrey and Gray's Flora of North America. Within the species itself are recognized several subdivisions, which in most cases are clearly distinguishable by definite characters and by having different ranges, but they are shown to be of less than specific value by the existence of specimens having intermediate characters, and by the fact that their ranges overlap.

Linnaeus in founding *H. arborescens*[2] based it solely on HYDRANGEA. Anonymos floribus albis parvis, etc. of Gronovius.[3] This description was drawn from the Clayton specimen, no. 79, from Virginia. It is a low shrub with large cordate acuminate glabrous leaves. By using a hand lens it appears that the leaves of this shrub of the stream-banks of Virginia are essentially but not absolutely glabrous, for the principal nerves bear on the lower surface a short puberulence. This same character holds throughout the species and its varieties; in all cases the leaves are puberulent on the prin-

[1] *Lathyrus venosus* Muhl., see Butters and St. John, Rhodora xix. 156 (1917).
[2] Sp. Pl. i. 397 (1753).
[3] Fl. Virginica i. 50 (1739).

cipal nerves of the under surface. Just such a plant as that described by Linnaeus occurs from New York southward to Georgia and westward to Illinois, Missouri, and Oklahoma.

Another *Hydrangea* has flowers, fruit, and the pubescence of the leaves identical with those of *H. arborescens* L., but differs from it in having lance-ovate or lance-elliptic leaves that are oblique at base. This is exactly the plant separated as γ *oblonga* by Torrey and Gray.[1] Its range is somewhat more extensive than that of *H. arborescens*, reaching from New York southward to Georgia and Alabama and westward to Illinois, Missouri, Oklahoma, and Louisiana. In most cases this plant is strikingly different from *H. arborescens*, but there are frequent intermediate specimens. These show in some cases the lance-elliptic leaves oblique at base on the lower part of the plant, while the upper one or two pairs of leaves may be cordate-ovate exactly as in *H. arborescens*. In other cases the leaves of the entire plant are intermediate in shape between the two just described. In other cases the leaves show a pubescence on the lower surface on the secondary as well as the primary nerves. Because of the existence of these intermediate specimens it is felt that Torrey and Gray were quite right in maintaining the plant with narrow lance-elliptic leaves as a variety of the species. It should be known as *H. arborescens* L., var. *oblonga* T. & G.

Another variant of the species, though strikingly different from the others, has never received a name. It has often been collected, but it has always been identified either as *H. arborescens* L. or as *H. cinerea* Small.[2] Identical flowers and fruits clearly show that its true re-

[1] Fl. N. Am. i. 591 (1838–1840).

[2] By studying the original material the author has determined that *H. cinerea* Small is a mixture. Dr. Small cites five specimens in the original publication but does not indicate at this place that any particular one was designated as the type. One of these was of his own collection and on that sheet in the Columbia College Herbarium is written, "Type". This is a vigorous specimen with large cordate, acuminate leaves well coated on the lower surface with a dense gray short puberulence. This specimen represents exactly what is described here as *Hydrangea arborescens* L., var. *Deamii* St. John. The F. L. Scribner specimen from White Cliff Springs, Tennessee, has the same short crisp puberulence on the under surface of the leaves, but they differ in shape and size, being smaller and oblong-lanceolate. This is one of the specimens considered to be intermediate between var. *oblonga* T. & G. and var. *Deamii* St. John of *Hydrangea arborescens* L. In the original description of *H. cinerea* Small, the leaves are said to be "gray tomentose * * * beneath." Two of the cited specimens, both from the same region, Chilhowee Mountains and Chilhowee Gap, Tennessee, A. H. Curtiss, no. 833, and Kearney, June 24, 1893, have this gray tomentose pubescence. It is exactly like the heavy coat of fine white tomentose

lationship is with *H. arborescens* L. It also has the large cordate-ovate acuminate leaves of that species, but they are more coriaceous and are densely puberulent beneath owing to the fact that all of the nerves, even the smallest secondary ones, bear puberulence. This variant is not found in the northern Appalachians, occurring only from Ohio to Illinois and southward to Oklahoma, Tennessee, and Georgia. As in the previous case there are intermediate specimens. Such a one as that from Kennesaw Mt., Georgia, May 16, 1885, R. N. Larrabee has the leaf form of var. *oblonga* but the pubescence of the more western pubescent plant. Then there are plants with the pubescence so sparse on the secondary nerves, that it becomes a matter of fine judgment whether or not the plant should be considered *H. arborescens* L., or the pubescent plant under discussion. Again, this plant seems to be properly treated as a variety of *H. arborescens* L. Mr. Charles C. Deam, who has recently collected this variety in Indiana, has noticed that it differed from the essentially glabrous *H. arborescens* L., and has called my attention to it. Consequently I take pleasure in dedicating this new variety to him.

There is a sterile or radiant form of each one of these three plants, although they have been found but a few times in the wild state. Their rarity is well brought out by a note on a specimen of *H. arborescens* L., var. *oblonga* T. & G. in the Gray Herbarium collected at Bedford, Virginia, June 25, 1871, by A. H. Curtiss. He writes, "I have for seven years in N. & S. Va. searched for radiant flowers on this sp[ecies] but never till this year found them & these on a single bush. So I conclude they are of very rare occurrence." This specimen has only a few of its marginal flowers radiant and would not in the present classification be considered as of the radiant form, which has all of its flowers sterile and radiant. In classifying these showy forms it is necessary to give one new name and to make one new combination.

pubescence characteristic of *H. radiata* Walt., except for the color. A careful examination of these two sheets shows that the leaves seen from above have the great blotches of brownish or blackish color which are characteristic of poorly dried specimens or those dried under unfavorable conditions. Also both specimens have been poisoned with a solution of corrosive sublimate as is shown by the yellowish stains on the sheets. Consequently, it seems evident to the writer that the gray color of the pubescence is due to the poor drying and the poisoning and that these two specimens are without question *H. radiata* Walt. The remaining one, Scribner, July, 1894, of the five specimens on which *H. cinerea* Small was based has not been seen by the author.

In the course of this study the author has used the collections of the Gray Herbarium, the Arnold Arboretum, Columbia College Herbarium, the Herbarium of the New York Botanical Garden, the California Academy of Sciences, and the private herbaria of Mr. C. C. Deam, Mr. Walter Deane, and Mr. F. W. Hunnewell. To Dr. B. L. Robinson, Dr. J. K. Small, Mr. C. C. Deam, and Mr. J. C. Nelson, he is indebted for extended loans of specimens or books. Specimens are cited from each state where they have been collected, but in most cases only one from each state is listed.

The following notation is used to indicate the location of a cited specimen:

(C) = Columbia College Herbarium
(Cal) = California Academy of Sciences
(D) = Herbarium of Mr. C. C. Deam
(G) = Gray Herbarium of Harvard University
(N) = Herbarium of the New York Botanical Garden

Key to Hydrangea arborescens and its Variations.

A. Leaves nearly glabrous beneath, the scanty puberulence confined to the principal nerves.
  B. Leaves cordate or rounded at base, broadly ovate or suborbicular with an acuminate tip.
    C. Some or all of the flowers fertile.....1. *H. arborescens* L.
    C′. All of the flowers sterile and radiant.....2. f. *grandiflora* Rehder.
  B′. Leaves oblique at base, lance-ovate or lance-elliptic.
    D. Some or all of the flowers fertile.....3. var. *oblonga* T. & G.
    D′. All of the flowers sterile and radiant...4. f. *sterilis* (T. & G.) St. John
A′. Leaves closely short-puberulent beneath, all of the secondary nerves bearing hairs, cordate or rounded at base, broadly ovate or suborbicular, acuminate at tip.
  E. Some or all of the flowers fertile.....5. var. *Deamii* St John
  E′. Most all of the flowers sterile and radiant.....6. f. *acarpa* St. John

1. Hydrangea arborescens L., Sp. Pl. i. 397 (1753); *H. vulgaris* Michx., Fl. Bor.-Am. i. 268 (1803); *H. cordata* Pursh, Fl. Am. Sept. i. 309 (1816); *H. vulgaris* Michx., β *cordata* (Pursh) Torr., Ann. Lyc. N. Y. ii. 205 (1827); *H. arborescens* L., var. *vulgaris* (Michx.) Ser., DC. Prodr. iv. 14 (1830); *H. arborescens* L., β *cordata* (Pursh) T. & G., Fl. N. Am. i. 591 (1838–1840); *H. arborescens* L., f. *typica* Schneider, Ill. Handb. d. Laubholzk. i. 387 (1905); *H. arborescens* L., f. *vulgaris* (Michx.) Schneider, l. c. 387; *H. arborescens* L., var. *typica* Schneider, Ill. Handb. d. Laubholzk. ii. 943 (1912).

Distribution: New York: Wellsburg Narrows, Chemung Co., July 2, 1896, September 17, 1897, *T. F. Lucy*, no. 5,490 (N). Pennsylvania: Nescopec, Luzerne Co., July 2, 1889, *A. A. Heller* (G.).

District of COLUMBIA: in silvis frequens prope Washington, July 15, 1888, *Th. Holm* (Cal). WEST VIRGINIA: Banks of Blackwater River, Hendricks, Tucker Co., *J. M. Greenman*, no. 213 (G). NORTH CAROLINA: Blowing Rock, August 9, 1893, *B. L. Robinson*, no. 134 (G). GEORGIA: ravines, Madison Springs, September, *H. W. R[avenel]* (G). INDIANA: rocky wooded ravine just west of Aurora, *C. C. Deam*, no. 6,842 (D). KENTUCKY: Big Black Mountains, Harlan Co., *T. H. Kearney, Jr.*, no. 154 (G). TENNESSEE: bluffs along Tennessee River, Knoxville, *A. Ruth*, no. 336 (G). ALABAMA: riverbank, Montgomery, June 1, 1897, *C. F. Baker* (N). ILLINOIS: shady rocks, St. Clair Co., June 29, 1877, *H. Eggert* (G). MISSOURI: along bluffs, Noel, *B. F. Bush*, no. 4,987 (G). OKLAHOMA: in ravine, north side Rich Mt., near Page, Leflore Co., *G. W. Stevens*, no. 2,749 (G).

2. H. ARBORESCENS L., f. GRANDIFLORA Rehder, Mitt. Deutsche Dendrolog. Gesell. 71 (1907).

DISTRIBUTION: Found wild in Ohio and introduced into cultivation. OHIO: specimen from this source cultivated at the Arnold Arboretum, June, 1907, *Alfred Rehder* (G). TENNESSEE: Nashville, *Wilkinson* (G).

3. H. ARBORESCENS L., var. OBLONGA T. & G., Fl. N. Am. i. 591 (1838–1840); *H. cinerea* Small, Bull. Torrey Bot. Club xxv. 148 (1898), in part; *H. arborescens* L., f. *oblonga* (T. & G.) Schneider, Ill. Handb. d. Laubholzk. i. 387 (1905).

DISTRIBUTION: NEW YORK: near Painted Post, Steuben Co., July 24, 1884, *Miss I. S. Arnold* (G). NEW JERSEY: rocky woods, Phillipsburg, August 15, 1909, *K. K. Mackenzie*, no. 4,281 (D). PENNSYLVANIA: near Smithville, Lancaster Co., *Heller & Halbach*, no. 541 (G). DISTRICT OF COLUMBIA: Herb. *A. Gray* (TYPE G). WEST VIRGINIA: rocky woods, White Sulphur Springs, Greenbrier Co., *K. K. Mackenzie*, no. 412 (D). VIRGINIA: on Round Top Mountain, west of Seven Mile Ford, Smyth Co., July 2, 1892, *J. K. Small* (G). NORTH CAROLINA: rich shady woods, Biltmore, June 21, & September 28, 1897, *Biltmore Herbarium*, no. 1,339 b (G). GEORGIA: rich shady woods, Athens, June 25, 1900, *R. M. Harper*, no. 35 (G. & N.). INDIANA: on a wooded hillside about three miles west of New Albany, Floyd Co., *C. C. Deam*, no. 9,374 (D). ALABAMA: Greensboro, 1857, *S. Watson* (G). KENTUCKY: Kuttawa, Lyon Co., June 2–18, 1909, *W. W. Eggleston*, no. 4,756 (N). TENNESSEE: rich woods, Knoxville, *A. Ruth*, no. 2,025 (N). ALABAMA: Auburn, Lee Co., August 2, 1897, *Earle & Baker* (N). MISSISSIPPI: Waynesboro, Wayne Co., *C. L. Pollard*, no. 1,244 (G). ILLINOIS: rocky banks, Athens, Menard Co., 1861, *E. Hall* (G). MISSOURI: Meramec Heights, *E. E. Sherff*, no. 69 (G). ARKANSAS: Benton

Co., 1899, *E. N. Plank* (N). Louisiana: deciduous woodland, Baines, West Felicia Parish, August 23, 1912, *F. W. Pennell* (N). Oklahoma: at edge of thicket, near Mannsville, Johnston Co., *Florence Griffith*, distributed by *G. W. Stevens*, no. 3,447 (G).

4. H. arborescens L., var. oblonga T. & G., f. **sterilis** (T. & G.) comb. nov., *H. arborescens* L., ♂ *sterilis* T. & G., Fl. N. Am. i. 591 (1838–1840); not *H. arborescens* L., var. *oblonga* T. & G., f. *sterilis* (Rehd.) Schneider, Ill. Handb. d. Laubholzk. ii. 943 (1912). Torrey & Gray's var. *sterilis* differs from the var. *oblonga* only in having the "flowers all sterile and radiate." It is then better treated as a form under that variety than as of equal rank. Although the original collection was made before 1840, no subsequent ones have been seen.

Distribution: Pennsylvania: Wysox, *J. Carey* (Type in G).

5. H. arborescens L., var. **Deamii** var. nov., *H. vulgaris* Nutt., Gen. N. Am. Pl. i. 284 (1818), not Michx.; *H. cinerea* Small, Bull. Torrey Bot. Club xxv. 148 (1898), as to type specimen, not as to description and cotypes; *H. cinerea* Gray's Man. ed. 7, 450 (1908), in part, ab forma typica differt foliis grandis cordato-ovatis acuminatis coriaceis, subtus valde puberulentis, nervis primariis secundariisque etiam locis inter nervos pilos ferentibus.

Differing from *H. arborescens* L., in having its large cordate-ovate acuminate leaves more coriaceous and with the under surface clothed with a dense puberulence borne from the primary and secondary veins and even from the spaces between veins.

Distribution: Georgia: rich shady woods, Whitfield Co., *R. M. Harper*, no. 243 (G). Ohio: Cincinnati, *R. Buchanan*, no. 832 (N). Indiana: on an exposed place of the rocky slope of White River, one mile east of Sparksville, Jackson Co., July 15, 1919, *Charles C. Deam*, no. 28,122 (Type in G). Tennessee: rocky hillsides, altitude 2,300 feet, Lookout Mountain, July 1903, *H. A. Gleason* (G). Illinois: shaded bluff, Homer, Champaign Co., *A. S. Pease*, no. 13,028. Missouri: limestone bluffs, Neosho, *E. J. Palmer*, no. 3,999 (G). Arkansas: Benton Co., 1899, *E. N. Plank* (N). Oklahoma: along streams, Page, Leflore Co., *E. J. Palmer*, no. 12,640 (Cal).

6. H. arborescens L., var. Deamii St. John, f. **acarpa** forma nova, praecedenti similis sed differt floribus omnibus infertilibus radiatisque.

Differs from *H. arborescens* L., var. *Deamii* St. John by having all of its flowers sterile and radiant.

Distribution: Missouri: woods, Monteer, August 6, 1910, *B. F. Bush*, no. 6,116 (Type in G).

State College of Washington, Pullman, Wash.

THIRD REPORT OF THE COMMITTEE ON FLORAL AREAS.

The present report, covering all the families of the Fern Allies except *Isoetaceae* follows the lines of its two predecessors,[1] giving a check list of the New England species and a geographic grouping of them according to their ranges within our area. In the check-list are included all varieties recognized in Gray's Manual and nearly all proposed in subsequent revisions; some of these, which appear to be mere forms without distinctive or significant ranges are, however, omitted in the geographic treatment. The nomenclature is that of the Manual somewhat modified by the studies mentioned. The principal changes are: the restoration of the old sixth edition name *Equisetum limosum* in place of *E. fluviatile*, a change which proves to be required by the International Rules[2]; and the substitution of *Botrychium dissectum* for *B. obliquum*, the former being the earliest name in the group.[3] One of the Manual varieties calls for a new combination under *B. dissectum:* in making the transfer, this variety is here reduced to a form, since that appears to be its correct taxonomic status.[4]

PRELIMINARY LISTS OF NEW ENGLAND PLANTS—XXVIII.

[The sign + indicates that an herbarium specimen has been seen; the sign — that a reliable printed record has been found.]

Ophioglossaceae	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
Botrychium angustisegmentum (Pease & Moore) Fernald .	+	+	+	+	+	+
" dissectum Spreng. . .	+	+	+	+	+	+
" " f. elongatum (Gilbert & Haberer) Weatherby	+			+		—

[1] Rhodora xx. 181–185; 193–197 (Oct., Nov., 1918): xxii. 80–89 (May, 1920).

[2] Rhodora xxiii. 43–47 (Apr., 1921).

[3] See Clute, Fern Bull. x. 76 (1902).

[4] Botrychium dissectum Spreng., **f. elongatum** (Gilbert & Haberer) Weatherby, n. comb. *B. obliquum elongatum* Gilbert & Haberer, Fern Bull. xi. 89 (July, 1903).

Ophioglossaceae	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
Botrychium dissectum Spreng.						
" " f. obliquum (Muhl.) Fernald . .	+	+	+	+	+	+
" " f. oneidense (Gilbert) Clute . .	+	+	—	+		
" Lunaria (L.) Sw. . .	+		+			
" ramosum (Roth) Aschers.	+	+	+	+	+	+
" simplex E. Hitchcock .	+	+	+	+	+	+
" " var. compositum (Lasch) Milde	+	+	+			
" ternatum (Thunb.) Sw.						
" var. intermedium D. C. Eaton .	+	+	+	+		+
" " var. rutaefolium (A. Br.) D. C. Eaton	+	+	—			
" virginianum (L.) Sw. .	+	+	+	+	+	+
" " var. europaeum Angström	+	+	+			
" " var. intermedium Butters	+		+	+		+
" " var. laurentianum Butters	+					
Ophioglossum vulgatum L. . . .	+	+	+	+	+	+
" " var. minus Moore . .		—				
Marsileaceae						
Marsilea quadrifolia L.	+			+		+
Salviniaceae						
Azolla caroliniana Willd. . . .				+		

EQUISETACEAE	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
Equisetum arvense L.	+	+	+	+	+	+
" hyemale L., var. affine (Engelm.) A. A. Eaton	+	+	+	+	+	+
Equisetum hyemale L., var. intermedium A. A. Eaton			+			+
" limosum L.	+	+	+	+	+	+
" litorale Kühlewein	+	+	+	+		
" palustre L.	+	+	+			+
" pratense Ehrh.	+	+	+	+		+
" scirpoides Michx.	+	+	+	+		+
" sylvaticum L., var. pauciramosum Milde.	+	+	+	+		+
" " pauciramosum f. multiramosum Fernald	+	+	+	+	+	+
" variegatum Schleich.	+	+	+	+		+
" " var. Jesupi A. A. Eaton.	+		+			+
LYCOPODIACEAE						
Lycopodium annotinum L.	+	+	+	+		+
" " var. acrifolium Fernald	+	+	+	+		+
" " var. alpestre Hartm.		+				
" " var. pungens Desv.	+	+	+			
" clavatum L.	+	+	+	+	—	+
" " var. megastachyon Fernald & Bissell	+	+	+	+	+	+
" " var. monostachyon Grev. & Hook.		+				
" complanatum L.	+	+	+			
" " var. flabelliforme Fernald	+	+	+	+	+	+

Lycopodiaceae	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
Lycopodium complanatum L.						
" " var. Wibbei Haberer			+			
" inundatum L.	+	+	+	+	+	+
" " var. alopecuroides (L.) Tuckerm.				+		
" " var. Bigelovii Tuckerm.				+	+	+
Lycopodium lucidulum Michx.	+	+	+	+	+	+
" " var. porophilum (Lloyd & Underw.) Clute.	+		—			
" obscurum L.	+	+	+	+	+	+
" " var. dendroideum (Michx.) D. C. Eaton.	+	+	+	+	+	+
" sabinaefolium Willd.	+	+	+			
" Selago L.	+	+	+	+		+
" " var. appressum Desv.	+	+	+			
" " var. patens (Beauv.) Desv.			+			
" sitchense Rupr.	+	+	—			
" tristachyum Pursh	+	+	+	+		+
Selaginellaceae						
Selaginella apoda (L.) Fernald	—	+	+	+	+	+
" rupestris (L.) Spring	+	+	+	+	+	+
" selaginoides (L.) Link	+					

Two of the above species, *Marsilea quadrifolia* and *Azolla caroliniana,* are, the latter certainly and the former in all probability, introduced. The Azolla seems to have been first collected in a pond in Forest Park, Springfield, Mass., in 1892, by Mrs. M. L. Owen and in 1896 was reported as spreading. From information kindly furnished us by Dr. W. H. Chapin, it now appears to be extinct. There is no other New England locality for it on record.

Marsilea quadrifolia was first reported in the addenda to the fourth edition of Gray's Manual in 1863 from Bantam Lake, Litchfield, Conn., where it had been collected by Dr. T. F. Allen, and was long supposed to be native there. It does not appear, however, in J. P. Brace's comprehensive list of plants of Litchfield and vicinity published in 1822: very probably, as is surmised in the 7th edition of the Manual, it was "casually introduced" at some time between these two dates. Another Connecticut station, at Cromwell, is known to have existed for at least 45 years. The plant is easily established in still, shallow water and has been introduced at Maranacook and Skowhegan, Maine; Boxford, Billerica, Concord, Salem, Malden, Cambridge, Jamaica Plain, West Roxbury, Needham and Dedham in eastern Massachusetts; and, besides the two stations above mentioned, at New Haven and Middlebury, Conn.

The arrangement of the native species given below follows in general that of our last report: readers are referred to that report for definitions and explanation of groups there adopted. We have recognized here four new groups, for the reasons given under them and from the belief that better results can be obtained by creating categories as numerous as may be required to bring like ranges together than by attempting to crowd all our plants, almost endlessly various in their distribution as they are, into a few generalized divisions. Where possible, we have used, as titles for the groups, condensed statements of the ranges concerned and in so doing have employed more definitely than hitherto the Cape Cod region[5] and the upper St. John valley in northern Aroostook Co., Maine,[6] as, in some sort, index areas. These two regions—the former mainly of sandy, acid soils without rock outcrops and of oak and pitch pine barrens, the latter with heavy, often calcareous soils, river cliffs and wide stretches of Canadian forest; one with the mildest climate in New England, the other with one of the most severe—are well-nigh complete antitheses of each other. One offers the extreme of austral conditions, the other, (except for the very limited alpine areas on

[5] Comprising southeastern Plymouth County and all of Barnstable, Dukes, and Nantucket Counties. This region is not homogeneous, as the occurrence in certain localities within it of such woodland types as *Botrychium ramosum* and *Lycopodium lucidulum* testifies; but these boundaries seem sufficiently accurate for our present purpose. The region is referred to, for brevity, as Cape Cod.

[6] Comprising that part of Aroostook County north and west of the Aroostook Valley. Referred to as the upper St. John.

our mountain-tops) the extreme of boreal conditions within our territory. Species found in both may be expected to occur generally in New England elsewhere: and so much collecting has been done in both that the absence of any record of a given species from either may be accepted with little or no doubt as representing the facts.

It is to be understood that species which are alike in being found throughout a given area may differ considerably in the frequency of their occurrence. The groups here defined are, of course, likely to require revision with increase of our knowledge. The committee will be grateful for any data which modify the ranges as stated.

I. Generally distributed.

Botrychium ramosum
" virginianum
Equisetum arvense
" limosum
Lycopodium complanatum, var. flabelliforme
Lycopodium lucidulum
" obscurum
" " var. dendroideum
Lycopodium tristachyum

Although, at the present stage of our work, it is impossible to classify these species otherwise than as generally distributed and though they occur in all, or very nearly all, parts of New England, they differ somewhat in the details of their distribution. Only *Equisetum arvense, Lycopodium obscurum* and its var. *dendroideum* seem to occur quite evenly throughout. *Botrychium ramosum, Lycopodium complanatum,* var *flabelliforme* and *L. tristachyum,* though found in the Ft. Kent-Van Buren region, apparently become noticeably less common in northern Maine and were not observed by St. John and Nichols on their journey from Moosehead Lake to St. Francis via the upper reaches of the St. John River. *Botrychium virginianum,* though known from extreme southeastern Maine at Pembroke, conspicuously avoids the vicinity of the coast between that point and the Kennebec valley. *Lycopodium tristachyum* has, curiously, not been reported from Rhode Island though occurring on all sides of that state. It seems altogether probable that it will eventually be found there. The two Botrychiums, *Equisetum limosum,* and *Lycopodium lucidulum* are very rare in the Cape Cod region; thereby, their ranges form a transition to the following group.

II. Generally distributed, except in Cape Cod.

Equisetum sylvaticum,
var. pauciramosum[7] Lycopodium clavatum
Lycopodium clavatum, var. megastachyon

Species with this range (e. g., *Cystopteris fragilis*) occurred in the families previously reported upon, but were then included among the generally distributed species. It now seems to us, however, desirable to segregate them, since the absence of any plant from Cape Cod is likely to be significant of its preferences as to soil and habitat conditions.

The species here included are inhabitants of moist or dry woodlands or rarely meadows, in comparatively rich soils. Their absence from Cape Cod is doubtless due to lack of suitable habitats there.

III. Neither the upper St. John nor Cape Cod; rather general elsewhere.

Botrychium simplex Botrychium ternatum,
var. intermedium
Equisetum hyemale, var. affine

This group corresponds closely to the "Rich Soils" group of the last report. *Botrychium simplex* is not known to us from any point in Maine north of about the 45th parallel of latitude, except for a single outlying station at Bridgewater (Kate Furbish). *B. ternatum*, var. *intermedium* reaches slightly further north in central Maine and has similar outlying stations at Mars Hill and Limestone. These isolated occurrences are probably to be accounted for by the existence in eastern Aroostook County of a large area characterized by a hardwood forest of a distinctly southern type.[8] *Equisetum*

[7] Including, for our purposes, f. *multiramosum*. The stations for typical var. *pauciramosum* are all within the range of group III; but they are few and scattered and we doubt if their distribution indicates anything but accidents of collection.

[8] See Goodale in 6th Rep. Maine Board of Agric. 370ff. (1861). Prof. Goodale was struck by the contrast between the vegetation of this area and that of the upper St. John, from which he had just come. He had no opportunity to ascertain its extent. Prof. Fernald, to whom we are indebted for the reference to Goodale's work, informs us that it runs from the Aroostook Valley on the north to that of the Mattawamkeag on the south, and west to about the 69th parallel of longitude. On the southwest a narrow arm connects it with the hardwood forest area of central Maine, forming an avenue of emigration for woodland species.

hyemale, var. *affine*, which prefers loose soils, especially on terraces and banks near streams, has about the same northern limit as *B. simplex*, but without the outlying station: though it occurs at Pembroke in Washington Co., it has not been found near the coast between that point and Wells.

IV. Northern.

A

Equisetum scirpoides — Lycopodium annotinum
Lycopodium annotinum, var. acrifolium

B

Botrychium ternatum, var. rutaefolium	Lycopodium clavatum, var. monostachyon
Botrychium virginianum, var. europaeum	Lycopodium complanatum
Botrychium virginianum, var. laurentianum	Lycopodium sabinaefolium
Lycopodium annotinum, var. alpestre	Lycopodium Selago
Lycopodium annotinum, var. pungens	" " var. patens

Lycopodium sitchense

This group corresponds exactly with that of the same name in our last report. Of the species in sub-division A, *Equisetum scirpoides* reaches its southern limits at Southbridge, Mass., and in northwestern Connecticut. The two Lycopodiums reach Cape Ann, the central highland of Massachusetts and western Connecticut; *L. annotinum* var. *acrifolium* is found also at Union, in the eastern highland of Connecticut. It seems to be much less common in Maine than typical *L. annotinum*, and is not recorded by St. John and Nichols.

Of sub-division B, *Lycopodium annotinum*, var. *alpestre* is known in our area only from Mt. Lafayette, *L. clavatum*, var. *monostachyon* only from Mt. Washington and *L. Selago*, var. *patens* only from Mt. Mansfield. Typical *L. Selago*[9] is chiefly confined to mountainous

[9] Including var. *appressum*.

regions, occurring on Mt. Katahdin, the Bigelow Range, and Sargent Mt. on Mt. Desert Island in Maine, the White Mountain region and Mt. Monadnock in New Hampshire, Mt. Mansfield in Vermont and Mt. Greylock in Massachusetts. But it occurs also at lower altitudes at East Dover, N. H., and Johnson, Vt., has a station at Mt. Holyoke in Massachusetts and descends nearly to sea level at Deer Isle, Me., and on trap ridges near New Haven, Conn. The other species and varieties are all, apparently, rather rare, occurring at comparatively few and scattered stations in the three northern states. Only *Lycopodium annotinum*, var. *pungens* reaches the vicinity of the sea, at Lubec, Cutler and Wass Island on the cold eastern coast of Maine: only *L. complanatum* and *L. sabinaefolium*, which are both found at Hartland, Vt., extend further south than the White Mountain region.

V. Cape Cod and rather general elsewhere, but not the upper St. John.

Botrychium angustisegmentum	Botrychium dissectum, f. obliquum
Botrychium dissectum	Ophioglossum vulgatum[10]
Lycopodium inundatum	

This group corresponds essentially to the Southern A of the last report. *Botrychium angustisegmentum* and *B. dissectum*, like their congeners in group III, have outlying stations at Bridgewater, in the deciduous woods region of northeastern Maine. The former is not known from the Maine coast east of Boothbay. The four Ophioglossaceae are all plants of comparatively southern range, having their northeastern limits in New England or the Maritime Provinces. *Lycopodium inundatum*, on the other hand, is of wide distribution in northern latitudes in America and Eurasia, reaching, in the eastern United States, no further south than Pennsylvania. In any analysis of the geographic elements of the New England flora based on general ranges it would have to be placed in a different group from the other species here included; but within New England its occurrences correspond in general with theirs, except for two stations on the

[10] Including var. *minus*, which appears to be only a starved and depauperate state growing in sand. See Stone, Plants of Southern N. J. 122 (1911).

upper course of the St. John River, just north of the Aroostook County line (St. John and Nichols). Its distribution may perhaps be accounted for by the fact that it is a plant of acid soils, in southern New England at least particularly partial to damp sand, and that such habitats are largely lacking in northern Maine. Conversely, it is, unlike most plants of northern range, common on Cape Cod, where such habitats are to be found in abundance.

VI. Chiefly the three southern States

Selaginella apoda

This is the Southern B of the last report. *S. apoda* is not reported from Cape Cod, where suitable habitats for this plant of moist, grassy places are lacking It reaches its northern limits at Newfane, Vt., Hanover and Manchester, N. H., and Berwick, Me.

VII. Coastal Plain

Lycopodium inundatum, var. alopecuroides
" " " Bigelovii

The former is a plant of the Piedmont and coastal plain southward, occurring in our region only on Nantucket. The latter, like the coastal plain species of the last report, penetrates further inland. It is, however, certainly known to us no farther from the coast than Woodstock, Conn., and Groton, Mass., and no farther north than Plum Island, Mass. It has been reported from Sunderland, Vt., and Mt. Desert Island, Me. The Mt. Desert plant and also specimens from Cumberland, Me., distributed as var. *Bigelovii*, appear to us no more than, at most, transitional forms. We have seen no specimens from the Vermont locality; it seems probable, however, that this report is based either on a misidentification or on the misapplication of Tuckerman's name made by Lloyd and Underwood.[11]

VIII. Calciphile Species.

Botrychium Lunaria	Equisetum variegatum, var. Jesupi
Equisetum variegatum	Selaginella selaginoides

Botrychium Lunaria and *Selaginella selaginoides* are among our

[11] See Rhodora xxiii. 100 (1921).

rarest species. The latter is known only from Ft. Kent (A. A. Eaton) and from near the confluence of the St. John and Big Black Rivers (St. John and Nichols), the former from Ft. Kent (J. R. Churchill) and, in Vermont, Willoughby (C. H. Tilton) and St. Johnsbury Miss Inez Howe). *Equisetum variegatum* and its variety *Jesupi* occur at scattered stations in the larger calcareous areas of New England south to western Connecticut. It is a curious fact that, though their general ranges are the same, they have apparently never been collected at the same place nor nearer than 20 miles to each other.

IX. River-valley

Equisetum litorale Equisetum palustre
Equisetum pratense

These three species show a discontinuous range, not matched in any group heretofore distinguished. They are chiefly, though not entirely, confined to the valleys of the larger rivers and to the Champlain Valley—a distribution perhaps due to a preference for alluvial soils, to which, however, they are by no means restricted. *E. litorale* is known from the St. John, Penobscot, Kennebec and Androscoggin valleys in Maine; on the lower Merrimac; along the shores of Lake Champlain; and on the Connecticut at Stewartstown, Lebanon and Walpole, N. H., and Westminster, Vt. *E. palustre* occurs in the same valleys, except that of the Penobscot, extending south along the Connecticut to East Windsor and Lyme, Conn., and is found besides at Brandon, Willoughby Lake and near Lake Memphremagog in Vermont. *E. pratense* has a somewhat more irregular distribution. It is known only from the St. John, Kennebec, Connecticut and Housatonic valleys, and from Newark and Brandon, Vt.

X. Western New England only.

Equisetum hyemale, var. intermedium

This is referable to a small group to which *Trollius laxus* and *Hydrastis canadensis* of our first report belong. They are species of more or less wide range in the central United States, touching our area only along its western border and but rarely there. They penetrate eastward no further than the central lowland of Connecticut.

Equisetum hyemale, var. *intermedium* is known from Hartford, Suffield, Oxford and Norfolk in Connecticut and Pownal and Burlington, Vt.

XI. Miscellaneous.

Botrychium virginianum, var. intermedium

Lycopodium lucidulum, var. porophilum

Selaginella rupestris

Selaginella rupestris, the most widely distributed of these plants in New England, has a puzzling range It is a species of dry ledges, of Alleghanian range outside of New England. With us, it has two stations in extreme northern Maine; but it is almost entirely absent from the White Mt. region, occurring only on the extreme fringes of the mountains at Moultonboro and Berlin, and apparently from northeastern Vermont. In Maine, its stations, except for the two mentioned, are all either near the coast or in the valleys of the Androscoggin and Penobscot Rivers. It is fairly general southward, except on Cape Cod where it is not known—a circumstance readily accounted for by the absence of rock outcrops there. Recent taxonomic study of the group to which *S. rupestris* belongs has segregated a number of southern and western species formerly referred to it. The northeastern members of the group have not yet been critically studied; possibly we have to reckon with more than one species here.

Botrychium virginianum, var. *intermedium* is known from four stations, one each in Maine, Vermont, Massachusetts and Connecticut. More data in regard to it are needed. Similarly the New England stations for *Lycopodium lucidulum*, var. *porophilum* (northern Maine and Clarendon, Vt.) are too few to give any sure indication of the group to which it belongs.

C. H. Knowlton
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The date of the August issue (unpublished as this goes to press,) will be announced later.

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